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ABSTRACT

The introductory portion of this document reviews the definitions of cognitive style and presents the models of cognitive style developed by James McKenney, Samuel Messick, and Joseph Hill. It also discusses the application of these models to education. The annotated bibliography is designed as a review of selected materials that provide an introduction to the concepts of cognitive style; it is not a comprehensive review of the literature. Materials were selected on the basis of their "readability" for someone who is interested in an introduction to the concept. Writings providing information on each of the three models are included, as are articles which address themselves to the possible applications of cognitive style of education. Three comprehensive bibliographies and one research review are cited for further reference. (Author/DC)

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Cognitive Style:

An Introduction With

Annotated Bibliography

Prepared for:
"Cognitive Style: Recognizing Individual Differences"

A Commission XI Program Chaired by Kay Martens
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Educators recognize the importance of demographic differences such as sex, race, ethnic background and social class and are very aware of differences in achievement in their students. "Nevertheless, there are other kinds of individual differences to which educators should be alert, and we can expect such differences to exist even if demographic variables are held constant." (Kogan 71) In measuring individual differences, educational psychologists have concentrated on those differences most closely tied to traditional educational goals; verbal and numerical ability. Personality and motivational differences have been assessed in the counseling process. More recently, emphasis on individual differences in education has focused on time or rate with the mastery learning and competency based approach to education.

Although the measurment of abilities has been of primary concern to educators for decades, little consideration has been given to the 25 years of psychological research on cognitive style. "The emphasis of researchers on cognitive styles has been on understanding the response of people to their environments. Education might be defined in much the same way; at its best, it prepares people and societies to deal effectively with environments." (Cross 74) One of the leading researchers in cognitive styles, Herman Witkin, believes that this research can be helpful in improving educational practices.

> "While relatively little research has been done, compared to what is possible and needed, it is already clear that cognitive style is a potent variable in students' academic choices and vocational preferences; in students' academic development through their school career; in how students learn and teachers teach, and in how students and teachers interact in the classroom." (Witkin 73)

Definitions

Messick (1969) has defined cognitive styles as information processing habits which represent the learner's typical modes of perceiving, thinking, remembering and problem solving. They are "stable, relatively enduring consistencies in the manner or form of cognition". For Ausubel (1968) cognitive style refers to both individual differences in cognitive organizational and various self-consistent personal tendencies that are not reflective of human cognitive functioning in general. Ausubel, like Messick, sees styles as enduring individual differences. McKenny's definition of cognitive style considers both cognitive strategies and habits. "Cognitive style reflects an individual's propensity and preference for coming to terms with the data-stimuli of his environment through particular modes of thinking that are partly conscious strategies and partly unconscious habits." (McKenny and Keen 73) Both information gathering and information processing patterns are considered.

The Hill definition differs from those developed in psychology. Cognitive style represents the manner in which an individual seeks meaning from his environment. (DeLoach et. al., 71) It is defined as the cartesian product of four sets: (1) symbols and their meanings, (2) cultural determinants, (3) modalities of inference and (4) memory-concern. Hill, unlike some of the psychological researchers, believes that the cognitive style of an individual can be changed by the process of training and education.

Differences between Cognitive Style and Abilities

Cognitive styles appear to have some of the same properties as abilities; but according to Kogan, (1971) "a difference in emphasis should be noted: Abilities concern level of skill--the more and less of performance -- where as cognitive styles give greater weight to the manner and form of cognition." Messick sights the following ways in which cognitive style and abilities differ:

1. Abilities and the measurement of abilities tend to emphasize the maximum of performance. The concern is with the extent to which a person can solve problems under optimal conditions, sometimes called standard or standardized. Cognitive styles are more concerned with the individual's typical behavior, the extent to which a person spontaneously approaches a particular person.

2. Ability dimensions tend to be unipolar; they extend from nothing up to a lot. Cognitive styles are contrasts of one kind of performance vs. another kind of performance that has a different, usually opposite, element but not completely opposite characteristics. The characteristics are just different rather than necessarily opposite.

3. Ability dimensions are fairly-heavily value-ladden, whereas with cognitive style there is none of the value differentiation. For every one of the cognitive styles you can define circumstances where it is good to be in one direction and another circumstance where it is good to be in the other. The value differentiation is a function of situation and task.

4. Cognitive styles and abilities differ in their intellectual origins. The concept of abilities has historically been tied to education and there has been a close relationship between the measurement of abilities and the application of ability measurement in education. Work on cognitive style has come out of the psychological laboratory with the concept developing out of personality theory.

Models of Cognitive Style

The three models of cognitive style presented here differ in their research origins and in the extent of their current application to education. The nine dimensions identified by Messick comprise those most solidly established by years of research in the psychological laboratory. The McKenney model is derived primarily from the research of Witkin and Bruner and has been in the research and development process, in studies primarily with Harvard Business school students, for several years. Hill's model of cognitive style, developed as part of his framework for education known as the educational sciences, was designed for application purposes.

Cognitive Dimensions Model

Messick (1970) lists and describes nine separate cognitive dimensions that have been the object of systematic theoretical and empirical examination by various researchers. "These dimensions have been conceptualized as cognitive styles, which represent a person's typical modes of perceiving, remembering, thinking and problem solving." (Messick 70) The Educational Testing Service is presently considering these nine dimensions for the possible development of a test battery. These dimensions are bi-polar.

1. Field independence vs. field dependence: An analytical vs. a global way of perceiving. Field independence entails a tendency to experience items as discrete from their backgrounds and reflects ability to overcome the influence of an embedding context. Field dependence focuses on the relationship of items and their background. This dimension, identified by Witkin and his associates, is the most thoroughly researched. The numerous studies have shown, among other things, that there are positive relationships between field independence and verbal, mathematical and special abilities. Evidence of field dependence indicates that individuals with this style are more sensitive to their social environment and more adept at interpersonal communications.

2. Scanning: Differences in the extensiveness and intensity of attention deployment. Attention deployment may be broad or narrow, and individuals' style may be to scan or to focus. The bulk of the research on this dimension has concentrated on scanning as extensiveness of attention deployment. No educational application has been made. This dimension may overlap to some degree with breadth of categorization and conceptual differentiation styles.

3. Breadth of categorizing: Consistent preferences for broad inclusiveness as opposed to narrow exclusiveness in establishing the acceptable range for specified categories. Given an established category, the broad categorizer prefers to include many items and lessen the risk that something might be left out. The narrow categorizer, however, will exclude items to lessen the risk of including something that might not belong. There is a strong tendency for individuals to be consistently broad or narrow across the quantitative, verbal and geometric domains.

4. Conceptualizing Style: The tendency to conceive of things as having many properties as opposed to few. This style includes both conceptual differentiation and compartmentalization. Conceptual differentiation relates to the number of similarities and differences perceived; and hence, the number of categories selected or groups formed in a sorting task. Compartmentalization relates to the utilization of particular conceptualizing approaches as basis for forming concepts.

5. Cognitive complexity vs. simplicity: Individual differences in the tendency to construe the world, particularly the world of social behavior, in a multidimensional and discriminating way. This style concerns the number of dimensions available to a person in understanding his environment. A high complexity style sees diversity, conflict and contradiction, whereas the low complexity style is more attuned to consistent regularities in the environment.

6. Reflectiveness vs. impulsivity: Individual consistencies in the speed with which hypotheses are selected and information processed. The impulsive style tends to offer the first answer that occurs even though it is frequently incorrect while a person with a reflective style is more likely to ponder various possibilities before deciding. The emphasis is on the speed of evaluation of cognitive products. The style generalizes over diverse tasks. Several studies have been done relating this style to the education of children.

7. Leveling vs. sharpening: Reliable individual variations in assimilation in memory. Levelers show a tendency to assimilate new precepts to previously presented materials, to over generalize. Sharperers separate memory of prior stimuli and current information, they over-discriminate Kogan believes that this style could have important implications for education. "If the major portion of classroom learning involves reception of information into existing cognitive structures, as Ausubel (1963) claims, it would be highly surprising if leveling-sharpening tendencies did not influence the learning and retention of meaningful new material. It is quite astonishing to discover how little empirical research has been directed to so important an educational issue." (Kogan 71)

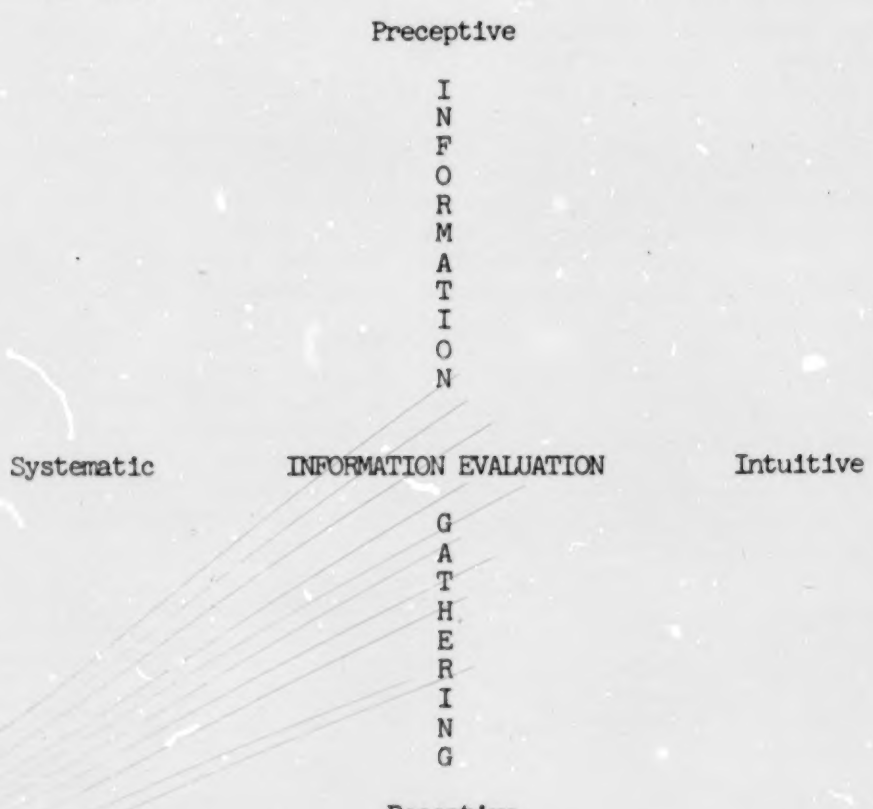
8. Constricted vs. flexible control: Individual differences in susceptibility to distraction and cognitive interference in tasks containing conflicting cues. The constricted control style tends to be susceptible to distraction and to retain incidential information while the flexible control style is more able to concentrate on the task at hand without noting interference.

9. Tolerance for unrealistic experiences: A dimension of differential willingness to accept perceptions at variance with conventional experience. A high tolerance style shows readiness to accept and report experiences which may vary with either conventional reality or what the individual knows to be true.

In addition to these nine dimensions there is a risk taking vs. cautiousness dimension which has been identified by Kogan. "Risk-taking generally implies that low probability-high payoff alternatives are preferred over high probability-low payoff alternatives; cautiousness implies the opposite order of preference." (Kogan 71) Research by Kogan and Wallach indicates that an individual's risk taking level varies with the particular choice situation presented.

The McKenney Model

The cognitive style model developed by Jim McKenney and his associates at Harvard is based on certain assumptions about the nature of human information processing activities. "Human information processing is composed of two general modes of behavior: First, communicating with the environment to obtain data and to return data to other people. Second, organizing data received to bring relevant experience to bear to make useful predictions. Man's information processing is essentially a cognitive process of communicating with the world and manipulating information that comes to him." (McKenney 72) The basic premise of the cognitive style model according to Nelson (1974) is that, "the world imposes huge quantities of data on the individual and that in response, the individual selects and uses only part of that data as 'information'." In McKenney's definition of style, individuals develop both conscious strategies and unconscious habits for taking in information and assessing that information in order to solve problems and make decisions. Rather than being bi-polar like each of the dimensions listed in the previous model, this model includes the two dimensions affecting the different aspects of human information processing; information gathering and information processing.



The information gathering dimension is the preceptual process by which the mind organizes and codes the wide variety of visual and auditory stimuli it encounters. The following are descriptions of each style.

> "Preceptive individuals bring to bear concepts to filter data; they focus on relationships between items and look for deviations from or conformities with their expectations. Their precepts act as cues for both gathering and cataloging the data they find."

> "Receptive thinkers are more sensitive to the stimulus itself. They focus on detail rather than relationships and try to derive the attributes of the information from direct examination of it instead of from fitting it to their precepts." (McKenney & Keen 1974)

Individuals also differ in their processes of analy ing the information they have gathered. The information evaluation dimension, which relates to problem solving, reflects these differences.

> "Systematic individuals tend to approach a problem by structuring it in terms of some method which, if followed through, leads to a likely solution."

> "Intuitive thinkers usually avoid committing themselves in this way. Their strategy is more one of solution testing and trial-and-error. They are much more willing to jump from one method to another, to discard information, and to be sensitive to cues that they may not be able to identify verbally." (McKenney & Keen 1974)

On this model, an individual's style may be either predominately preceptive or receptive in the process of gathering information and either predominately systematic or intuitive in evaluating that information. Thus, an individual may show a preference for one of four possible styles; intuitive preceptive, intuitive receptive, systematic preceptive, or systematic receptive.

Nelson (1974) lists four points which summarize the general descriptior of the model:

1. It deals with information processing rather than with personality or motivation

2. It is two-dimensional rather than the traditional bipolar dimension

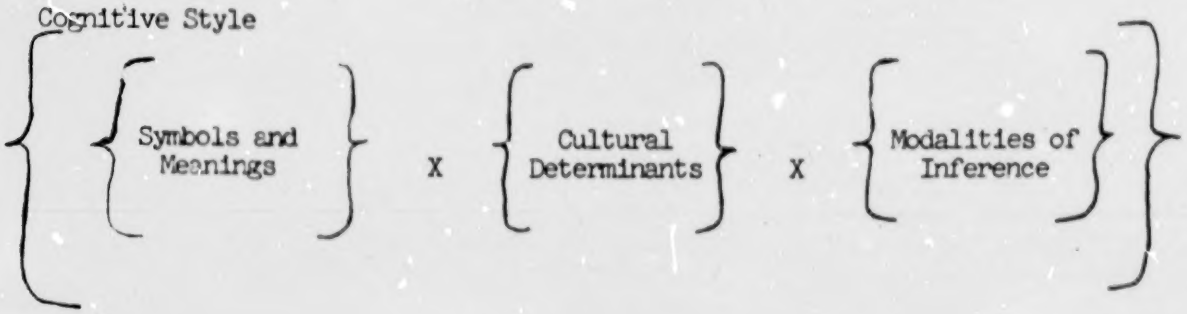
3. The two dimensions deal with information gathering and information evaluation

4. Each individual has an information processing space which delineates the extent to which he tends to use each of the four modes.

She notes that the model, as with other dimensions of cognitive style, attempts to impose no value judgements. As with the other dimensions not everyone has a dominate style. Research on this model has been predominately with Harvard Business school students. McKenney and Keen are currently interested in the application of the model to the managerial decision-making process.

The Hill Model

This model of cognitive style was developed by Joseph Hill, president of Oakland Community College, as part of his conceptual framework for education known as the educational sciences. The educational sciences, of which there are seven, were developed to provide a framework and a common language from the applied field known as education. The fifth science is that of cognitive style. It is composed of the first four sciences in his model. "The concept of cognitive style is expressed as, what mathematics call, a Cartesian product of sets." In this context, cognitive style can be considered somewhat related to Guilford's 'dimension of intellect'. Where Guilford's model is a Cartesian project of three sets that represent intellect, content and things, the Cartesian project designed to represent cognitive style is composed of the following four sets: 1) symbols and meaning, 2) cultural determinants of the meaning of symbols, 3) modialities of inference, and 4) neurological, electrochemical and biochemical aspects of memory functions." (Hill 1970D) Since data on the functions of memory is still incomplete, the first three sets are currently used to represent the cognitive style model.



Each set in this model is composed of a series of elements which interact with elements in the other sets to form the individual's cognitive style. In the first set symbols have been defined as something which stands for something else. The elements include two types of symbols; theoretical and qualitative. Theoretical symbols are those which have more generalized meaning in our society — words and numbers. Symbols from which individuals develop more personalized meanings are called qualitative. They derive their meaning from three areas, sensory data, humanly constructed formalisms such as games and programmatic effects of objects which convey an impression of images, scenes, events or operations. Symbols are modified by each individual according to his cultural background or cultural determinants of meaning. The three major determinants are family influences, associates of friends and an individual's own personal assessment. After symbols are modified by cultural determinants, the individual makes tentative conclusions about their meaning based on his characteristic thought processes. These processes, shown as modalities of inference, may be either inductive or deductive.

This model of cognitive style is currently being used at Oakland Community College in Michigan. Dr. Hill and his staff have worked with educators at all academic levels to train them in the use of his model.

Application to Education

Brief mention has been made of the application of each of the particular models to education. The Hill model, since it was designed for that purpose, has had the most use in the field. Through application of the educational sciences to their setting educators are to be able to identify the cognitive styles of their students, understand their own styles and prescribe personalized educational approaches. DeLoach, Dworkin and Wyett (1971) have briefly described the procedures.

1. Cognitive styles of students, teachers and administrators are mapped.

2. Based on the information obtained, an educational prescription is prepared and the student is matched, if possible, with compatible teachers (matching strategy) or placed in a situation where his style may be expanded through contact with experiences designed to add new elements to his style (augmentation strategy).

3. The student and teacher jointly plan and define educational goals based on the student's cognitive style. Emphasis may be on independent study, lectures, programmed instruction, seminars, films, etc.

4. Constant feedback mechanisms insure that both teacher and student are aware of progress or lack of it. Modification of the program is possible at regular intervals if the student is not progressing satisfactorily.

Work being done with the application of the cognitive dimensions model is still in an experimental stage. Messick (1974) has given attention to the development of matching strategies to modify instruction in particular ways for particular styles of students. The four possible matches he suggests are:

1. Remedial: To build missing skills.

2. Compensatory: The development of teaching strategies that avoid the use of skills the student doesn't have.

3. Capitalization: The development of programs that build on the strengths of students.

4. Challenge: Deliberately mismatching with the hope of helping the individual become more flexible.

According to Cross (1974) cognitive style permits both students and teachers maximum opportunity to develop the teaching/learning styles that are effective for them. She sees the current emphasis on cognitive styles as especially welcome in education and includes it in a model for education which, rather than attempting to remediateaway individual differences, accepts them as a challenge.

Bibliography

The following bibliography is designed as a review of selected materials that provide a good introduction to the concept of cognitive style. It is not a comprehensive review of the literature. Writings providing information on each of the three models are included as are articles which address themselves to the possible application of cognitive style in education. Materials were selected on the basis of their "readability" for someone who is interested in an introduction to the concept. Three comprehensive bibliographies (Berry & Sutton, Nelson, and Witkin et. al.) and one research paper (Steinke) are included for further reference.

1) Barry, J.J. and T.J. Sutton. The Educational Sciences: A Bibliography with Commentary. Bloomfield Hills, Michigan: American Educational Sciences Association, 1973.

This comprehensive bibliography of the educational sciences, including the Hill model of cognitive style, begins with a five-page overview of the materials included. The bibliography itself lists writings which provide a synthesis of the educational sciences; historical references for each set; a listing of dissertations and monographs; and publications relevant to the educational sciences listed by set.

2) Bravman, Susan K. Personalizing the Psychology of Personal Adjustment. Paper delivered at The National Conference on Personalizing Instruction, Georgetown University, April 1974. (available from the author, at Tompkins-Cortland Community College, 170 North Street (Rt. 13), Dryden, New York 13053)

This paper provides an example of the application of the Hill model of cognitive style in a community college classroom. In it, Bravman discusses her program for her development of objectives and audio-visual materials and the use of cognitive style mapping. She states that she has found cognitive style useful in matching students' learning styles with both teaching and instructional styles and gives some examples of the instructional options she has provided in the course.

3) Cross, K. Patricia. The Elusive Goal of Educational Equality. Speech presented at the Annual Meeting of the American Council on Education, San Diego, October 10, 1974.

In this excellent speech, Cross looks at higher education in the 1970's, focusing on educational equality. She discusses various programs designed for the new learners and groups them in models based on their seemingly different assumptions about egalitarian education. Model I is remedial and is based on the assumption that given the opportunity and a little remediation of individual differences, all learners will emerge with the same traditional achievements and rewards. Model II accepts individual differences as an educational challenge by providing for varying instructional methods for individual differences in rate and style. Model III, the Pluralistic Model, plans for individual differences in both approach and outcomes in education. Cognitive style is discussed as it contributes to Model III and Cross states that its emergence in education is especially welcome at this time.

4) DeLoach, Joseph F., Leo Dworkin and Jerry L. Wyett. The Educational Sciences: An Overview. Rochester, Michigan: Social Systems Associates, 1971.

This sixteen page paper written by three faculty members from Oakland Community College, provides a good introduction to the educational sciences, including cognitive style. In addition to explaining each of the sciences, the authors briefly describe how they

are used. An introduction to the language of cognitive style and a definition of key terms are provided. Those who have difficulty with Hill's mathematical style of writing will appreciate this introductory paper.

5) Ekstrom, Ruth. Teacher Aptitude and Cognitive Style: Their Relation to Pupil Performance. Paper presented at the American Psychological Association, 82nd Annual Convention, New Orleans, August 31, 1974.

The main focus of Ekstrom's paper is on teacher knowledge and teacher aptitude. She presents cognitive style as an important variable in understanding how teachers teach and the classroom interaction of teachers and students. A brief summary of the research on teaching and matching strategies is provided. This paper is important for its focus is on teacher, rather than student, learning and performance.

6) Glaser, Robert. "Individuals and Learning: The New Aptitudes" in Wittrock, M.C. (Ed). Changing Education. N.J.: Prentice-Hall, 1973.

Glaser's chapter, which was his AREA 1972 Presidential address, shows how recent work in psychology suggests new directions for educational research and practice. After reviewing research on general ability and aptitudes, Glaser suggests that there are "new aptitudes" that could be rewarded in a more adaptive educational environment. "Current lines of research indicate that a fruitful approach is the conceptualization of individual difference variables in terms of the process constructs of contemporary theories of learning, development and human performance." Glaser includes a discussion of cognitive style research as support for this idea.

7) Hill, J.E. Cognitive Style as an Educational Science. Bloomfield Hills, Michigan: Oakland Community College Press, 1970 (A).

In this short manuscript, Hill explains his concept of cognitive style as a Cartesian product of three sets. (Memory is not included in this particular writing.) It is written in the language of set theory. Mapping and augmentation of an individual's cognitive style are also explained.

8) Hodge, Francis P. (Ed). Cognitive Style Research: A Report of a Seminar. Albany, New York: Two-Year College Development Center, 1974.

In July of 1974, a seminar on cognitive style was held at the campus of the Educational Testing Service in Princeton. The purpose of this seminar, chaired by K. Patricia Cross, was to discuss the state of the art of cognitive style research and the possible applications of that research to the community college. Researchers attending the seminar, Wilbert McKeachie, James McKenney, Samuel Messick, Carol Ann Moore, Len Sperry, and Herman Witkin, responded to questions form the staff of the Two-Year College Development Center, SUNYA. The proceedings, edited by Hodge from tape transcripts, are presented in two sections; quoted discussion on the state of the art and responses to specific questions. Those who have done some

preliminary reading on the cognitive dimensions and McKenney models will find this interesting reading.

9) Keen, Peter G.W. Cognitive Style and the Problem-Solving Process. Working paper 700-74 (revised version): Sloan School of Management, Massachusetts Institute of Technology, Cambridge, 1974.

Keen's paper provides an example of research on the McKenney model, focusing on problem-solving. Keen explains his work in identifying and measuring cognitive style. He included a description of the tests used and the subjects' responses.

10) Keen, Peter G.W. and J.L. McKenney. The Evolution of an Experimental Design for the Study of Cognitive Style. Working paper, Harvard Graduate School of Business Administration, Boston, 1973.

For those interested in either the McKenney model or in understanding the development of a cognitive style research project, this paper is an important source. Keen and McKenney describe the inception of the project beginning with a seminar at Stanford in 1968 and continuing through the 1970-1972 Harvard Project. Measures of cognitive style and the Harvard project experiments are discussed. Since the spring of 1972, the authors have focused on the application of this model to decision-making which they believe extends the model. Two doctoral dissertations with this focus are described.

11) Kogan, Nathan. "Educational Implications of Cognitive Styles." in Lesser, Gerald S. (Ed). Psychology and Educational Practice. Glenview, Ill.: Scott-Foresman, 1972.

This chapter provides the best introduction yet written to the nine cognitive dimensions identified by Messick and Kogan's own dimension, risk-taking vs. cautiousness. Kogan defines each dimension, identifies assessment procedures designed to measure it, reviews the research that has been done on it and discusses its application to education. Also included is a general consideration of the ways in which cognitive styles can be expected to articulate with educational objectives.

12) McKenney, James. Human Information Processing Systems. Working paper, Harvard Graduate School of Business Administration, Boston, 1972.

After an introductory discussion of computer based information systems, McKenney looks at human information processing. He provides a model of human information processing and relates this to cognitive style. McKenney then discusses systematic and intuitive styles of individuals and systems. Although this may not be the best place to begin understanding the McKenney model, it provides important information on the underlying theory of the model. It will be of particular interest to computer specialists.

13) McKenney, James L. and Peter G. W. Keen. "How Managers' Minds Work". Harvard Business Review, 1974, 53, 3, 79-90.

In their first published writing on the McKenney model of cognitive style, the authors stress its application to the managerial decision-making process. "We view problem solving and decision making in terms of the processes through which individuals organize the information they perceive in their environment, bringing to bear habits and strategies of thinking." The authors explain the model and the characteristics of the different styles and summarize the results of their experimental studies with it. Each style is then related specifically to the management process and recommendations for action are made.

14) Martens, Kay. A Program of Correct Terms for Cognitive Style Maps. Albany, N.Y.: Two-Year College Development Center, 1973.

This programmed text was designed to teach the language of the Hill model of cognitive style. By working through the program, the reader will have a definition for and a general understanding of each of the 26 elements on the Cognitive Style Map. Those who have read the introductory materials on this model and want a better understanding of the specific components may find this a useful way to continue their reading.

15) Merrill, Charles. Cognitive Style - An Introduction. Unpublished Tape: Cobleskill Agricultural and Technical College, Cobleskill, N.Y., 1975. (available from author, at State University of New York, Agricultural and Technical College, Cobleskill, New York 12043)

This excellent introduction to the concept of cognitive style is presented on cassette tape with an accompanying study guide. The objectives of the unit include defining cognitive style, recognizing differences between styles and strategies, distinguishing cognitive style from ability and summarizing how an awareness of cognitive style can make a difference in how you deal with others. Perfect for those whose style is to listen rather than to read.

16) Messick, Samuel. "The Criterion Problem in the Evaluation of Instruction: Assessing Possible, Not Just Intended, Outcomes." in Wittrock, M.C. and David E. Wiley (Eds). The Evaluation of Instruction: Issues and Problems. N.Y.: Holt, Rinehart, and Winston, 1970.

This paper discusses cognitive styles and affective reactions as two major classes of criterion variables that should be taken into account in the evaluation of instruction. Messick defines cognitive style and identifies nine dimensions noting the major researchers of each. He discusses the research on Witkin's field-dependence-independence dimension in some detail and mentions other studies of cognitive style. Considerable attention is also given to the implications of cognitive style for educational practice and evaluation. This important chapter is also found in Len Sperry's Learning Performance and Individual Differences. (Scott Foresman, 1972)

17) Nelson, Karen H. A Bibliography of Cognitive Style Research. Working paper, Harvard Graduate School of Business Administration, Boston, 1973.

Nelson begins her bibiliography with the statement: "A thorough understanding of cognitive style research requires an appreciation of a large body of literature." The 35 pages of references and the 51 page introduction provide a good way to start developing that understanding. Her bibliography which she describes as not exhaustive, organizes psychological literature with respect to the McKenney model of cognitive style. References are listed in eleven different categories; cognitive style, problem solving, information processing, decision making, perception, conceptual behavior, personality factors, creativity, developmental data, business and organizations and testing and measurement.

18) Nelson, Karen. Introduction to Cognitive Style. Unpublished paper. Harvard University, Cambridge, 1974. (available from author, at Office of Instruction, Research & Evaluation, Harvard University, 11 University Hall, Cambridge, Massachusetts 02138)

This 7-page paper provides a brief introduction to the McKenney model of cognitive style. The author describes the model and provides operational definitions and examples of the styles it identifies. There is also a general discussion of the implications of this cognitive style model for communication, teaching and learning and career selection. This is probably the best place to begin introductory exploration of the McKenney Model.

19) Sperry, Len (Ed). Learning Performance and Individual Differences. Glenview, Ill.: Scott, Foresman and Company, 1972.

According to Sperry, in recent years many educators and psychologists have been developing new perspectives of the teaching-learning process. Through chapters discussing expectancy, learning style and instructional style, Sperry introduces this new perspective in the study of learning and learning performance based on person-environment interactions. His introductory chapter provides an excellent overview of current work. Part three on learning style includes chapters by Messick, Witkin et al., Bruner et. al., and Kagen. Sperry's final chapter provides a prospective on the theoretical and practical significance of the new view. An excellent reading in the whole area of individual differences.

20) Steinke, Ronald. Cognitive Style: A Review of Past and Current Published Research. Unpublished paper. Arapahoe Community College, Littleton, Colorado, 1974.

This paper represents an extensive review of the research on cognitive style. Steinke identifies major researchers and sources, general research and reports, and two working models which attempt to bridge the gap between theory and application (McKenney and Hill). The appendix includes a synopsis of selected cognitive style models (Witkin, Gardner, Kagen and Segal, and Broverman); an extensive annotated bibliography of publications relative to cognitive style and a general bibliography. In summarizing his study, Steinke concludes: "The research demonstrates

that there is a viable construct known as cognitive style, that it can be documented and that there are potentials for its application in educational and other settings."

21) Warren, Jonathan. "Adapting Instruction to Styles of Learning". Findings, ETS, Vol. 1, No. 1, 1974.

In a recent study of two-year college students, Warren and Roelfs found each of two different instructional styles, student-centered and instructor-centered, was preferred by a sizable group of students. In this writing, Warren describes each group of students and draws parallels between the instructional style preferences and the cognitive style dimension of field-dependence-independence. He suggests that instructor-centered (field-independent) students "are probably better served than student-centered ones by traditional methods of instruction". Some implications of cognitive style for instructional procedures are discussed.

22) Witkin, Herman. The Role of Cognitive Style in Academic Performance and in Teacher-Student Relations. Research Bulletin RB-73-11. Princeton, N.J.: Educational Testing Service, 1973.

Witkin discusses cognitive and personal characteristics of the field-dependence-independence dimension of cognitive style. The research illustrating the effects of cognitive style in academic development and career choice is presented. Also discussed is the influence of this style dimension on a teacher's way of teaching, a student's way of learning and the effects of a match or mismatch on how well they get along. Witkin concludes by focusing on the ways in which cognitive styles are particularly suited to the educational setting and the advantages they offer over standard intelligence tests.

23) Witkin, Herman. A Cognitive Style Perspective on Evaluation and Guidance. Princeton, N.J.: Educational Testing Service, 1973, 1974.

In this writing, Witkin focuses on evaluation as diagnosis and suggests that cognitive style information is "likely to be more meaningful, more comprehensive, and less threatening to the person" being diagnosed than traditional ability and personality characteristics. He discusses three features of cognitive styles that can make this true: 1) they minimize value emphasis, 2) they focus on non-verbal domains of cognitive functioning, and 3) they are expressions of broader dimensions of functioning that extend into the personality domain. The author hopes that people will be characterized in terms of "cognitive maps" which will emphasize their individuality.

24) Witkin, Herman A. Educational Implications of Cognitive Style. Speech presented at the University Deans Meeting of the Council of Graduate Schools in Phoenix, Arizona, December 4, 1974.

In this important presentation Witkin discusses several implications for education from research on the field-dependence-independence dimension of cognitive style. Included is a description of a longitudinal study of

the role of cognitive style in academic development through the high school, college and graduate/professional school years. The introductory section defines cognitive style and explains several measures of field-dependence-independence.

25) Witkin, Herman A., Philip O'Hman, Patricia Cox, Elizabeth Ehrlichman, Robert Hamm, and Robert Ringler. Field-Dependence-Independence and Psychological Differentiation: A Bibliography through 1972 with Index. Research Bulletin RB-73-62. Princeton, N.J.: Educational Testing Service, 1973.

This 246-page bibliography lists 1508 references and provides an index of standard categories for the reports. It lists and classifies published papers, papers given at meetings and dissertations on field-dependence-independence and "the broader dimension of psychological differentiation of which this cognitive style is a component". Included with each reference is information on the test used in the study and the characteristics of the population.

26) Witkin, Herman A. and Carol Ann Moore. Cognitive Style and the Teaching-Learning Process. Paper presented at the annual meeting of the American Educational Research Association, Chicago, Illinois, April 15-20, 1974.

The authors begin their paper by stating that application of a cognitive style approach to classroom situations is in its beginning stages. Their writing focuses on the effects of the personal characteristics associated with the field-dependence-independence dimension. The more social orientation of relatively field-dependent and more impersonal orientation of relatively field-independent persons and the influences of these orientations in learning situations are discussed.

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